appear in each jaw, but that the further progress of these could not be observed, none of the specimens the author has had opportunities of inspecting, appearing to be more than seven years old.

Mr. Home proceeds next to observe, that the elephant, the Sus æthiopicus, and the wild boar, are the only recent animals in which he has hitherto met with so extensive a masticating surface of the grinding teeth; the human species only excepted, in which the mode of dentition is somewhat upon the same principle as that of the wild boar, with this difference, that the hindmost teeth, called, from the late period of life at which they cut the gum, Dentes Sapientiæ, do not exceed the others in size, and have often not sufficient room in the jaw to come into their regular place. A conjecture is hence derived, that when the period of man's life was longer than it is at present, the growth of the posterior part of the jaw was continued for a greater length of time, so as not only to make room for the present, but perhaps also to admit of a succession of a still greater number of additional grinders.

Upon comparing the grinders of the boar with the large fossil teeth found on the banks of the Ohio, they were found so much alike, both in their external appearance and internal structure, as to render it more than probable that they are teeth of the same kind, only differing in size. Not so, however, those of the fossil skeleton some time since found in South America, and described by M. Cuvier. These were found so unlike those of the boar, or the above-mentioned incognitum, as to leave no doubt of its being an animal of a different genus.

From the progressive mode of dentition above described, it is inferred, that the animals to which it appears to be peculiar, have by nature been intended for great longevity. This we know to be the case in the elephant: and though opportunities have not yet offered for ascertaining the term of life of the wild boar, some quotations from ancient authors are here adduced, which indicate that boars of enormous size have at different times existed; whence the probability is inferred that their bulk must have been the growth of many years.

*Account of some Experiments on the Ascent of the Sap in Trees. In a Letter from* Thomas Andrew Knight, *Esq. to the Right Hon. Sir* Joseph Banks, *Bart. K.B. P.R.S.* Read May 14, 1801. [*Phil. Trans.* 1801, *p.* 333.]

The author prefaces his paper by declaring that the cause of the ascent of the sap in trees appearing to him not to have been as yet satisfactorily accounted for, he resolved to enter on an experimental inquiry on the subject; and that having met with some facts of which he had found no mention in any author, he flattered himself an account of them might not be unacceptable to the Society.

The first experiments were made with a view to determine whether the sap does actually, as has been thought by some, ascend along

the bark. For this purpose, circular incisions were made round a number of young healthy trees, and the bark removed for the space of about half an inch, or more, of the whole circumference. This, it was found, by no means impeded the growth of the upper part of the tree; but, on the other hand, the part of the stem below the incision scarcely grew at all, and in time even seemed to wither. From the whole of this investigation it seems probable, that the current of sap which adds the annual layers of wood to the stem, so far from ascending, actually descends from the young branches and leaves through the bark. The branches and leaves which supply this fluid became hence the next objects of the inquiry.

The conjecture just now mentioned was here confirmed by the circumstance, that when a branch or leaf was left between two circular incisions, it continued to receive its nourishment as usual; and the bark under it gave evident marks of increasing vegetation, while that above was not only stationary, but seemed even to decay.

It became now necessary to investigate by what channels leaves receive their nourishment. Some annual shoots were cut from trees, and placed in a coloured infusion. Although this fluid, it was observed, certainly rose into the leaves, yet neither the bark nor the medulla was sensibly tinged by it; but in the centre of the stalks of the leaves were found several bundles of tubes which had been manifestly coloured, and must hence have been the channels of communication. These tubes were surrounded by others, which, being traced downwards, were found to enter the inner bark, and by no means to communicate with the tubes of the wood: these being colourless, it may reasonably be concluded that they convey a different fluid from that which ascends into the leaf.

To the former, or internal tubes, which had not yet been distinguished by any name, the author thinks fit to assign the appellation of Central Vessels. He then mentions certain spiral tubes which are everywhere appendent to these vessels, and seem to proceed from the sides of the medulla to the leaf-stalk. Particular attention is then paid to the action of the medulla. By extracting parts of it out of the stems of trees, so as completely to interrupt its continuity, it was proved beyond a doubt that it is nowise necessary for the progression of the sap, the tree growing equally, whether this marrow be or be not continued.

The next set of experiments relates to the fructification: and here central tubes were likewise found in the fruit-stalks, which, there is reason to think, are the nourishing ducts of those productions. Many curious circumstances are here mentioned concerning the internal organization and mode of nutrition of certain fruits, such as apples and pears, for which, as well as for several observations on the error of those who have ascribed the ascent of the sap to capillary tubes, or to the sole agency of heat, we must refer to the paper, in order to hasten to the part in which the author points out an agent to which he thinks the mechanical propelling force required may be reasonably ascribed.

In all kinds of wood, he says, there are two sorts of grain,—the false or bastard, and the true or silver grain. The former consists of the concentric circles which mark the annual increase of the tree; and the latter is composed of thin laminæ, diverging in every direction from the medulla to the bark, with different degrees of adhesion to each other at different seasons, and lying between and pressing on the sap-vessels of the alburnum.

If these laminæ are expansible under various changes of temperature, or from any other cause arising from the powers of vegetable life, our author conceives that they are as well placed as is possible to propel the sap to the extremities of the branches. That they are affected by the changes of temperature in the air is proved by the effects of these changes on them even after the tree is dead, as in the instance of boards, which warp more or less, according to the direction of this grain: and other instances are given of the effects of solar heat on different parts of plants, which materially favour this assertion.

The general conclusions derived from these experiments are, That the tubes of the alburnum, acted upon by the agency of the silver grain, are in fact the channels which, extending from the extremities of the roots to the points of the annual shoots, convey the nutricious juices to the base of the buds, and in the soft and succulent part of the annual shoot, where the alburnum with the silver grain ceases to act, and where commences the action of the central vessels, with their appendages the spiral tubes;—that having through these reached the end of the leaves, the sap undergoes a change, perhaps from the action of the atmosphere, and is then brought back again through the external vessels of the leaf-stalks to the bark, which conveys it to every part of the tree, and ultimately contributes to its growth.

In speaking of the use of the medulla, the author assigns his reasons for considering it as a reservoir of moisture, which it occasionally imparts to the leaves and fruit through the central vessels, and which these organs must often stand in need of, as they cannot, like animals, resort to the brook or shade. The heart or coloured wood of the trees he considers as the bones in the animal œconomy, being intended to support them against the effects of winds and other destructive agents; and, accordingly, it is not found in roots or tender shoots, but is only formed when the vegetable has acquired a bulk which renders such a structure necessary.

*Additional Observations tending to investigate the Symptoms of the variable Emission of the Light and Heat of the Sun; with Trials to set aside darkening Glasses, by transmitting the Solar Rays through Liquids; and a few Remarks to remove Objections that might be made against some of the Arguments contained in the former Paper.* *By* William Herschel, *LL.D. F.R.S.* Read May 14, 1801. [*Phil. Trans.* 1801, *p.* 354.]

This may be considered as a supplement to Dr. Herschel's paper on the nature of the sun, lately read to the Society, and consists